OCTOBER 1960
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Earth Science

Rockhounds' NATIONAL MAGAZINE

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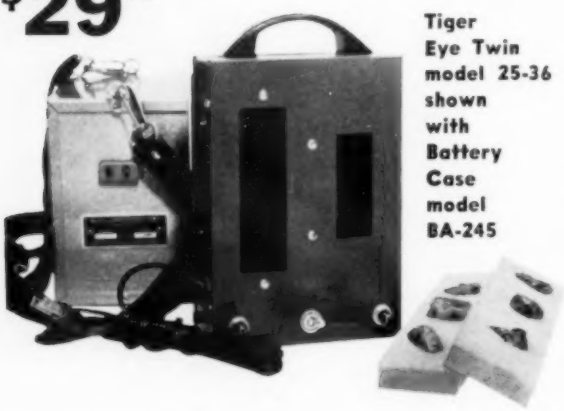

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Earth Science

Volume 13
No. 5
$2.50 a Year

Official Publication of the Midwest Federation of Mineralogical Societies.

EARTH SCIENCE PRESENTS FOR OCTOBER, 1960

Cover ..... JOAQUIN MILLER'S CHAPEL

A beautiful setting for a beautiful young lady. Photo taken in the Oregon Caves National Monument, illustrating many varieties of cave formations, including stalactites, helictites, stalagmites and columns. See explanation by James F. Quinlan, page 189. *Courtesy, U.S. Department of Interior.*

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Earth Science Digest

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Editor's Memo Pad

ISHPEMING FIELD TRIP

MORE than 800 Midwest Club members and visitors from other Federations were on hand to register for the 20th Annual Convention of the Midwest Federation held June 30th to July 4th in the iron and copper country of Upper Michigan, with headquarters at Ishpeming. Field Trip conventions are held every 3rd year by the Midwest in lieu of the more formal type where exhibitors and dealers dominate the scene.

The Ishpeming Rock and Minerals Club were hosts on the occasion and under the most efficient leadership of their president "Bob" Markert, who also was president of the Midwest Federation, a superb job of planning and entertaining was done. Well organized daily field trips, 14 in number all told, planned by the hosts, were made to well known collecting areas, besides many local trips made by smaller groups and individuals who prefer to travel on their own.

Excellent programs were held daily, trading posts and silent auctions and visits to splendid local collections added much to the interest of everyone, and the meeting closed on Sunday evening with two fine banquets, one for the adults and another for the 'younger fry.' The adult banquet was the largest ever held by the Federation and was the occasion at which beautiful commemorative plaques were presented to all past presidents by the Federation.

Midwest members will forever be indebted to the entire Ishpeming Club working together as a well knit team for a very wonderful time, which promises long to be the high-light of the many other fine conventions of the Federation held throughout years past.

The usual business meeting and the selection of site for the 1961 Convention, which is to be at Saginaw, Michigan, took place. B.H.W.

THANK YOU ISHPEMING!

ASSOCIATE EDITOR HONORED

DONNAFRED HOFF, director of our art lapidary section, was selected as the out of state Judge for the Wind River Valley Artist Guild Show held in Riverton, Wyoming during the first week of August. She and two other local judges also had "one man shows" of 20 paintings each. The Wind River Valley Artist Guild is comprised of members from Lander, Riverton and Dubois, and many other out of state artists. This annual event always attracts many visitors.

* * * *

LETTERS OF INTEREST

Downers Grove, Illinois.

Earth Science Editor:

You may be interested to learn that during my long recent illness my associates of "Telephone Pioneers of America" wanted to keep me in good reading material, and upon my recommendation they presented me with a copy of "The Evolution of North America" by Phillip King.

This selection was made easy for me by just turning through my back issues and looking over your good Book Reviews which are always so ably abstracted by your several expert reviewers.

May I congratulate you and your staff for your increasingly useful, attractive, and well illustrated magazine.

Dr. Wilbur L. Hoff

* * * *

Bloomington, Indiana.

Dear Editor:

I appreciate your kindness in sending me two copies of the review of Fossils: Prehistoric Animals in the Hoosier Rocks which appeared recently in EARTH SCIENCE. I believe the review was a very fine appraisal of my publication.

Very cordially yours,

T. G. Perry,
Associate Professor of Geology
Indiana University

Franklin Mineral Notes

A tribute is due John S. Albanese, who through the years has contributed many splendid articles published in Earth Science. He has one of the most ambitious individual projects in mineralogical history now well under way with the completion of the first year of publication of "Notes on the Minerals of Franklin and Sterling Hill, New Jersey."

Albanese, a dealer specializing in minerals of the rich Franklin area, is recognized as perhaps the ablest expert in sight identification of the scores of rare and unique minerals that have come out of the now depleted zinc mines in northern New Jersey. He has also had remarkable opportunity through purchase and distribution of large collections of Franklin minerals, and as a consultant to Harvard University and the National Museum in Washington to develop his knowledge of the complex mineralogy of this region.

In October, 1959, he began publication of the multigraphed quarterly which is now starting its second year. This first issue contained what is perhaps the best explanation extant of the geological processes that formed the Franklin area ore deposits. This subject was continued in the second number, together with extensive notes of the history of ownership and exploitation of the Franklin mines, extending as far back as 1730.

The geological study is continued in the third number, together with notes on the involved ownership of the Sterling Hill mines. The chief feature of the fourth number is a comparison of the minerals of Franklin and of Langban, Sweden, its nearest rival for number and variety of rare species. All of the numbers contain shorter notes on new species, changes in nomenclature and classification, and items of interest about collectors, mineralogists, and the history of the region which Albanese has run across in his long connection with the subject.

Present plans are to continue publication, if enough collectors are interested in supporting this solely non-profit quarterly. Now that an aggressive new mineral club is active at Franklin, and Prof. Charles Palache's classic Professional Paper No. 180 on "The Minerals of Franklin, N.J.," has been reissued by the U.S. Geological Survey, there should be a new awakening of interest in this locality, which supplies the most spectacular fluorescent specimens produced in the United States, and which is known throughout the world as an unrivaled source of unique species.

The excellence of John Albanese's quarterly publication "Notes on the Minerals of Franklin and Sterling Hill" has been recognized by the Library of Congress which recently subscribed and ordered all back copies.

Albanese still has a supply of issues of the first volume of the notes, which may be had for 50 cents each or $2 for the four. Subscription to the publication will be $2 a year, and the support of an additional 200 subscribers will enable him to continue with his service to collectors. Albanese's address is P.O. Box 221, Union, N.J.

—Russell P. MacFall

Ed. Note: Earth Science urges any of its readers who may be interested in the phenomena of fluorescence or fluorescent minerals to avail themselves of this opportunity before the supply is exhausted.

RIP RAP

California has honored one of her illustrious daughters, Mrs. Ruth Kirkby, by naming two previously unidentified fossil species "kirkbyae." Through her articles and lectures Mrs. Kirkby is well known to paleontologists throughout the entire country.

The city of New York has lost one of its engineers to the mineral business. Our felicitations to Winston Gold of Flushing on now being able to devote his entire time to Globe Minerals.

Many men with ideas have sighed with Job: "Oh, that my words were now written! Oh, that they were printed in a book!" Indiana's John Willhammer achieved his dream with "Rock Polishing for Everyone." Rock books and magazines are written to be read and a word of commendation is due to dealers who invest money and space in order that the best may be widely available. If you liked our little story "Agates, Anyone?" in the August issue, Lloyd Harazim of Office Specialties in Seattle writes to say he has the publications to which we referred you.

December issue ad deadline is October 10th!

Illinois Field Trips

Geological Science Field Trips to be held in the Fall of 1960 and the Spring of 1961, sponsored by the Illinois State Geological Survey, are as follows:

September 17, 1960—Milan, Rock Island County
October 1, 1960—Pana, Christian County
October 15, 1960—Harrisburg, Salina County

April 15, 1961—Sparta, Randolph County
May 6, 1961—Hamilton, Hancock County
May 20, 1961—Morris, Grundy County

For detailed information address the Survey at Urbana, Illinois.

"What Are You Looking For?"

PERHAPS, 'What is worth looking for,' would be a more appropriate question. As was the experience of the writer fifty years, more or less ago, whenever a geologist or a collector entered a farmer's barnyard seeking his permission to explore about his 'place' while searching for minerals or fossils, nine times out of ten the farmer would look up and drawl, "What are ye lookin' for, GOLD?"

How times have changed—now he most likely will say, "Are you looking for agates?" Be this as it may, what are we actually looking for? Too many rockhounds, it seems, simply go out collecting with nothing particular in mind, just looking around to see what they may find, and they do of course sometimes find many interesting things, frequently some of which being very much worthwhile.

Seriously, may we suggest that while all of us do have different objectives, depending of course upon our own individual tastes and interest, and in a measure where we live, and what actually may be found in our region—that one should not waste his time in looking for something that just isn't there. However there are many objects almost everywhere that one should always keep his eyes open for, and some of these may often be found in the most unexpected places. Allow us to mention at least three good items that are really well worth looking for.

First, the skeletal remains (bones, if you please) of large or perhaps even smaller mammals of former times which may frequently be found in the glacial drift of Pleistocene age, or even elsewhere upon occasion. Mammoth elephants and mastodons bones are always of utmost importance, and due to their large size and strength are frequently well preserved, and not too uncommon. Watch for them especially around places in swampy regions where excavations are going on. Many other things of interest may often be found there also.

Second, copper nuggets, both large or small, which may have been carried far southward, in fact as far as the glaciers extended, from the Copper Country 'way up north.' Due to their great weight these are seldom carried further than the southern limits of glaciation, while agates and other medium weight minerals are often even carried as far as the oceans. Copper nuggets, so called, are valuable and make interesting 'showpieces' in anyone's collection.

And lastly, but not least, there are the meteorites—"messengers from heaven," some being no larger than pebbles, and others—a few, which may actually weigh many tons. Farmer Harvey Meevers residing a few miles east of Mapleton, Iowa while plowing his corn, in 1939, struck a heavy object with his plow which turned out to be a rare iron meteorite now proudly displayed in the Chicago Natural History Museum. In our fast approaching space age meteorites are now becoming objects of untold value in aiding us to interpret many facts concerning our amazing Universe, which man must learn more about before he proceeds much farther. WATCH OUT FOR METEORITES, wherever you are. You may be the lucky person who by so doing may make a worthwhile contribution to science.

* * * *

OUR AUTHOR

We are proud to present another splendid article from the pen of Frank Moran, who wrote so interestingly on the subject "Materials of Chinese Jade" in our December 1959 issue. Our author has only recently returned from Hong Kong, where he visited his daughter while there, and no doubt had the opportunity to examine and study many beautiful art jade objects in their native environment. What a great thrill this must have given him.

Earth Science

Vol. 13.
No. 5
October, 1960

The Making of Chinese Jades

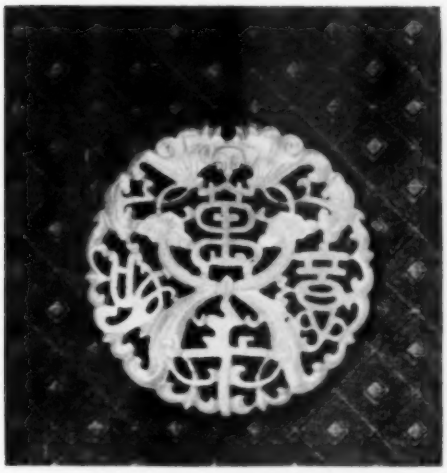
By FRANK MORAN

THE process of making a Chinese jade is usually called carving, and the result a jade carving. The process, however, is not carving in the sense of wood carving where a knife cuts pieces away from the material or in the sense of stone carving where hammer and chisel remove the stone. The carving of Chinese jades is a grinding operation using an abrasive and a tool to wear away and form the jade.

Just what kind of abrasives and what kinds of tools were used in making ancient Chinese jades is not too clear from the ancient writings. Directions for a "Do it Yourself" project in jade carving are not available from this source. Writers and historians looked down on manual labor as beneath their dignity, and perhaps the mastering and memorizing of the thousands of characters in Chinese writing left little time for other interests. Perhaps, too, the jade carvers jealously guarded the secrets of their craft from writers and all outsiders.

Probably very old carvings were made with quartz sand and soft tools such as bamboo. A creditable duplication of the small conical shaped holes in ancient jades can be made with a bamboo splinter and quartz sand. The larger holes such as those in "pi's" exhibit the same conical shape and were probably made using a bamboo section to grind a ring into the jade. The rings were ground from both sides and, on meeting, the center fell out leaving a large hole. The conical shape would indicate a soft tool which wore away rapidly in the grinding process.

The only other clue as to how ancient jades were carved with soft tools is the methods used by the Maoris in New



A pierced, fret-saw type medallion of white jadeite sculptured both front and back.

Jade vase of graceful proportions with loose ring handles rarely seen.

Zealand to carve "greenstone" or nephrite which is a jade. Up until the discovery of New Zealand in 1769, the Maoris were entirely ignorant of metals. Their weapons, tools, and ornaments were based on use of wood, whalebone, stone, and shells. A great deal of cutting of "greenstone" was done with wood and wetted sand. Cutting of pieces for clubs was done with thin slabs of sandstone which were set into wooden frames to make a saw. Slate was also used as a saw. Drilling of holes in the clubs was accomplished by fastening a sharp flint into the end of a stick, wrapping a string around the stick so that two ends could be pulled alternately, and pressing the sharp flint into the stone by a bearing. As the flints became dull they were replaced. The holes are crude with a large taper or crater on both sides. Ornaments, some in shape of a human, with better carving were also made. Perhaps the ancient Chinese used similar technics to produce jade carvings.

Later Chinese writings refer to a K'un-wu knife which, it was said, would cut jade like clay. The name K'un-wu was doubtless the region or source of smelted iron or iron in late Chou and Han times. In the "History of the Sung Dynasty" (Sung 317-420AD) there is a passage which reads, "Jade is an extremely hard material, and can only be carved by means of the K'un-wu knife and toad grease." Toad grease is general term for a greasy substance, and perhaps grease was used to keep the abrasive under the "knife" as it was worked back and forth by hand. Grease would make it easy to apply abrasive to the working edge and would tend to hold it in place.

The methods of carving described so far are crude and slow. Quartz abrasive, whether in the form of fine sand or in the form of sandstone, is not very efficient for carving jade. Its hardness is 7 on Mohs scale compared with a hardness of 6½ on Mohs scale for nephrite. The labor involved in carving with quartz is enormous.

By the time of the Tartar conquest of China and the setting up of the Mongolian dynasty under Kublai Khan (Genghis Khan), there are indications of a better abrasive being available. In the "History of the Yuan Dynasty" (Tartar 1280-1368AD) there is reference to setting up of an official sand depot in Mongolia for collecting sand produced by 106 families. The annual production was several hundred pounds for the 106 families and this production was sent to Peking for use of jade workers. The small output of "sand" for so many people would indicate the crushing and grading of some hard mineral into a "sand" suitable for grinding jade. This might have been garnets, but garnets are not much of an improvement over quartz for grinding since almandine garnets or spinel have a hardness of 7½. Probably the "sand" referred to was crushed black corundum or emery. This is native alumina or aluminum oxide and is the hardest mineral with exception of the diamond. Its hardness is 9 on Mohs scale, and it is an excellent abrasive. Corundum in a pure, translucent or transparent form is a gem, and if blue is known as sapphire, and if red as a ruby. The use of black corundum undoubtedly made possible the large carvings which begin to appear in the thirteenth century, but possibly this material was used before this time.

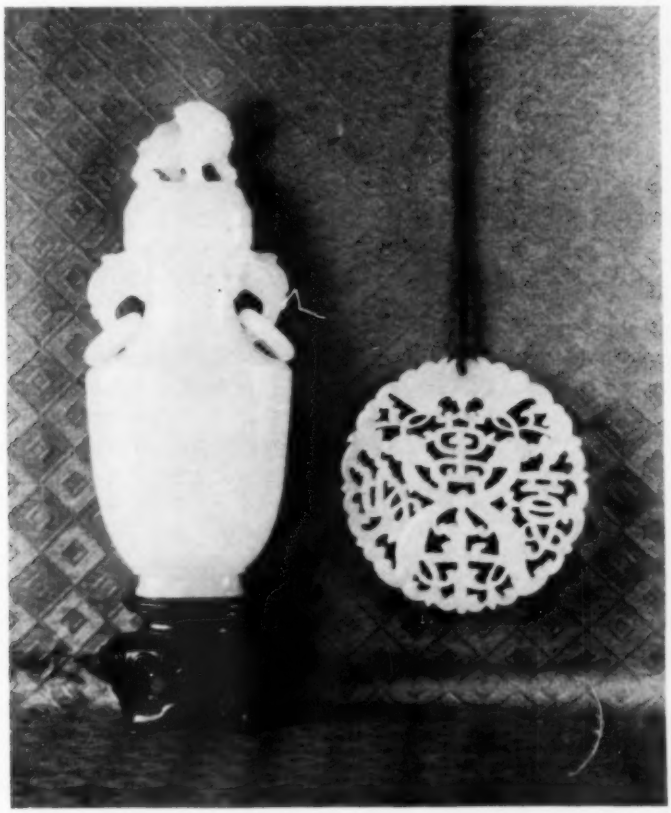
Perhaps the best known large carving of this time is a huge wine bowl which was described by Friar Odoric of Pordenone as a result of visiting China from 1323 to 1328. This is probably the same bowl that was in Peking before World War II and was photographed by the Crown Prince of Sweden. The jade is nephrite and most of the bowl is a dark green, so dark that the bowl is known as the "Black Jade Wine Bowl." There are streaks of lighter green and grey which are utilized in the design of the carving. Dragons and other monsters are shown diving and emerging from waves, and the whole design provides an impression of great strength and action. The bowl is somewhat irregular in shape and the diameter varies from three and a half feet to four and a half feet and the height is two feet. Friar

Odoric, in the fourteenth century, reported its value as being more than that of four great towns.

The actual mechanics used in carving these old large pieces will probably remain as much of a mystery as the mechanics used in building the Great Pyramids of Egypt. Perhaps rotary tools, instead of rubbing the jade by hand with tools, were used. Yet, references to rotary tools are few. The first definite statement of the rotary saw principle is in 1637, "When a piece of jade is to be divided, a circular iron plate is first made. Sand is put in a bowl of water. The plate is rotated by treading with the feet while sand is applied to it and gradually cuts into jade until at last the latter is sawn thru." The statement would indicate the use of a treadle lathe with a rope wound around the shaft and the two ends of the rope attached to two treadles. Alternate depressing of the treadles with the feet would cause the shaft with its attached saw to rotate in alternate directions. Another indication of early use of rotary tools is found in the grooves in some old pieces. When these are examined under a high power magnifying glass, very fine rotary scratches are observed which could have been made by a rotary tool, but references to rotary drills and tools in histories and literature are not known at these early times.

Modern Chinese carving methods in use between World War I and II were observed by an Englishman, Howard Harsford, in Peking and are perhaps similar to older methods. The modern

(*Continued on Page* 182)



Exquisitely carved vase of white jade, having loose ring handles and lid with symbolic figure. Symbolic jade plaque, elaborately carved by ancient craftsman.

An Acre of Cave Pearls

By GAIL F. MOULTON

ON August 2nd, 1958, a very unusual deposit of cave pearls was found in southwestern Virginia. The deposit is unique in that it is not under water. An investigation was undertaken to determine how this was possible.

Glenwood Church Cave, where the deposit was found, is located on the southeast side of Route 604, seven miles southwest of Tazewell, Virginia. The entrance is 50 feet up a steep, rocky slope on the east bank of Maiden Spring Creek.

The entrance room of the cave is 50 feet wide, 6 feet high, and 70 feet deep. The floor is covered with breakdown and hard packed dirt. Water drips from the entire surface of the roof, but the dripping is concentrated at the rear of the room, where two small streams seep into the entrance room from higher regions of the cave. The water leaves the entrance room by percolating through the floor. (Fig. 1.)

The cave pearls are located in a band that extends across the back of the entrance room. The deposit is 35 feet long, 15 feet wide, and 4 inches deep. It is under the section of the roof which drips the most, and the smaller of the two streams flows through the bed lengthwise. The dripping and the running water keep the pearls wet, but apparently not under water.

The pearls are all light tan in color, and range in size from 3 to 20 mm. in diameter. The largest are on the surface of the deposit and the sizes graduate downward. Those which are surrounded by other pearls are very smooth and lustrous, whereas those which are exposed to the air are rough and dull looking.

Several specimens were dissolved in hydrochloric acid, and it was found that they had formed around a quartz grain of sand. By cutting a number of them in half, it was observed that the internal structure of the larger ones is quite different from that of the smaller. The small pearls are dense, closely banded, and have no crystal structure visible to the unaided eye. The larger ones have a core of dense material which is surrounded by a wide area of coarse, porous material, which is in turn covered by a dense shell. (Fig. 2.) Very few of the large pearls are perfectly round. Most are oval, or roughly round.

Cave pearls are believed to be formed in the manner described by Norbert Casteret in *Ten Years Under the Earth*, an excerpt of which follows:

> "In a basin of moderate depth, fed by a cascading thread of water, the agitation of the water keeps grains of sand in suspension. If the water has enough calcium content, and the stream is not too violent, these little fragments roll

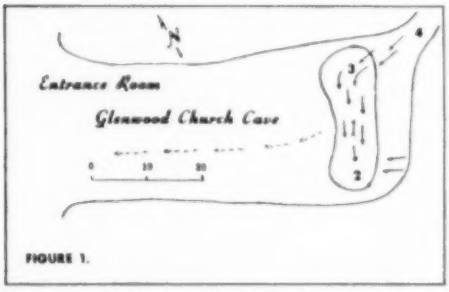


Figure 1. Solid arrows show the streams. Dashed arrows show where water would flow if water reached Point 1. Point 2 is the lowest part of deposit. Point 3 is the highest part of pearl deposit. Point 4 is a passageway as indicated.

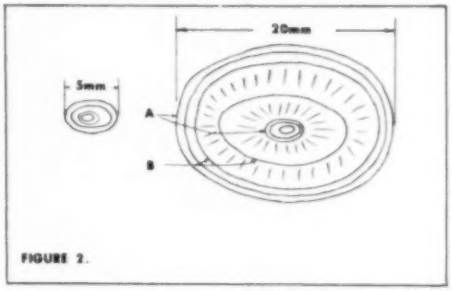


Figure 2. Cross section of Pearls, showing concentric layers of essentially the same materials, having structurally different character.
A. Dense calcium carbonate.
B. Course, porous calcium carbonate.

Highest part of pearl deposit.
(Point 3, Figure 1)

perpetually in the whirlpool, and gradually take on a limestone deposit. The pearl, continually rolled about, becomes almost spherical and extremely hard."

Mr. Casteret states further that the size of the pearls is limited to about that of a pigeon's egg, because when they approach that size they are too heavy to be agitated by the falling water and become attached to the floor.

In an article by J. Hoover Mackin and Howard A. Coombs (Journal of Geology, Jan. 1956) it was reported that by the observation of pearls in an abandoned iron mine it had been proven that cave pearls of 10 to 13 mm. can be formed in 35 to 42 years. The relatively short time of formation would indicate that if conditions were altered after the formation of a deposit it would take an equally short period to destroy them. If a deposit is found that has most of the known conditions required for the formation of pearls it can be assumed that the deposit is in the process of formation.

The pearl deposit at Glenwood Church Cave has all but one of the conditions throught to be necessary for pearl formation—the submarine condition. Even if the pearls were flooded, the water would flow out of the cave entrance before covering half of the pearls, because one end of the deposit is a full foot higher than the other, and also the entrance is at a lower elevation than the higher part of the pearl deposit. (Fig. 1.)

It was thought possible that the pearls could have been washed or rolled down from a higher section of the cave, but further investigation revealed no such possible source.

Pearls from Glenwood Church Cave. Assorted sizes—3 to 20 mm.

Depending on the calcium content of the water dripping on a deposit, three possible sets of conditions could result. 1) If there is little or no calcium in the water the pearls will be eroded away. 2) If there is too much calcium the pearls will be cemented together in a solid mass. 3) If the amount of calcium in solution is somewhere between the two extremes the pearls will either stay the same or increase in size.

Since there is no evidence to indicate erosion or cementation of the pearls in the Glenwood Church Cave, and keeping in mind the short period required to form or destroy cave pearls, the conclusion can be drawn that these are in a state of development. This would lead to the conclusion that a pool is not necessary for the formation of cave pearls as long as the deposit is kept wet and agitated by water dripping on it or trickling through.

Photos by author, Gail F. Moulton. Courtesy of the National Speleological Society.

A New Arkansas Diamond Find: The latest report of a worthwhile diamond find in the Arkansas fields, was one made by Niels Bach of Ludington, Michigan. A conservative estimate of its value is said to be about $6,000, and this isn't "peanuts" in anybody's pocket. Congratulations, Niels.

* * *

16th Chicago International Exhibition of Nature Photography

Deadline January 16, 1961. Exhibition February 5 thru 25, at the Chicago Natural History Museum, Chicago 5, Illinois. $1.00 plus postage for 4 slides. $1.00 plus postage for 4 prints. Entry forms from Mr. H. J. Johnson, 2134 W. Concord Place, Chicago 47, Illinois.

Mississippi River Pearls

By BEN HUR WILSON

FEW Midwest Rockhounds realize that some of the finest gem pearls are to be found in the 'fresh water clams' (mollusks) of our inland streams and waters.

Clam diggers who gather tons of mussel shells annually for the pearl button industry, frequently make nice side line profits by carefully searching for these gems while at their work. This has been going on for over a century. Individual pearls of highest quality have been found, which have been sold for as much as one thousand dollars.

The early Indians, who sometimes used the mussels for food, also knew about them and employed them for ornaments, as is evidenced by finds in their burial mounds. Even the shells of the mollusks themselves, which consist of very thin built up layers of the mineral aragonite (Calcium Carbonate) possess a most beautiful pearly lustre (nacre), which is known as 'Mother of Pearl.'

In the late eighteen sixties in the little town of Clinton, Iowa, several brothers used to hunt along the mudbanks of the Mississippi river for clams. From the shellfish they would extract the freshwater pearls and sell them. The youngest of these brothers was B. D. Howes. As he grew older, he bought up the pearls from his brothers and friends and sold them throughout the United States. In 1870 the firm of Howes Bros. was established in a small store in Clinton. Here B. D. Howes, Sr., grew up in the business.

The small Iowa firm gained a nationwide reputation for precious gems and counted many famous personages among its patrons, including the renowned stage beauty, Lillian Russell.

More than fifty years ago Mr. Howes became convinced that the great population and prosperity expansion of the future lay in California, and moved his family to Los Angeles. There in 1919, with his young son Durward, he established the first B. D. Howes and Son store in the Brack Shops in downtown Los Angeles. Specializing in genuine pearls, the firm soon became the recognized source for this exquisite gem, a position it holds to this day.

Incidentally, a great pearl button industry also has grown up, centered about Muscatine, Iowa, which has long been known as the pearl button capital of the world, which annually produces pearl buttons by the millions. For beauty and utility they have no equal. The mark of a high grade shirt or dress, is to this day the quality of the pearl buttons used thereon.

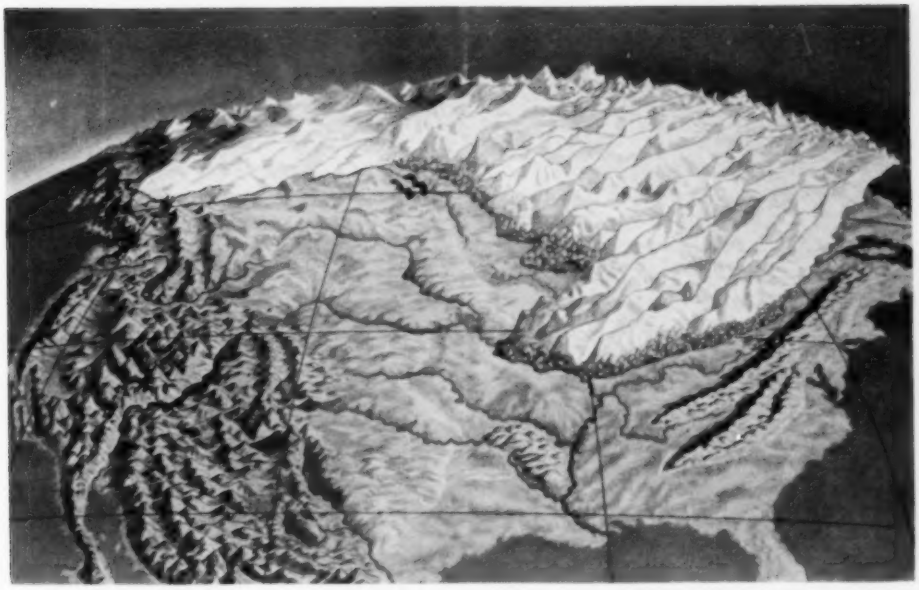
Recently, since cheap plastic materials, glass and other types of substitutes for good buttons have been encroaching upon their business, more and more of this beautiful 'mother of pearl' is being utilized for the making of brooches, pins, earrings and other forms of ornaments and jewelry, too numerous to mention. These also are being manufactured by the industry, which today is almost fighting for its survival.

As excellent lapidary material, this too is being employed most successfully by Joe and Betty Phetteplace in the making of their superb mosaics and other works of art, in their studios at Wauzeka, Wisconsin, along with other shells of various colors coming from many places throughout the world. They are now exhibiting what is said to be the World's most beautiful and elaborate mosaic of "The Century of Progress Exposition," of Chicago, consisting of more than ten thousand pieces, along with other art mosaics, in their home Museum at Wauzeka, where it is being viewed by hundreds of people annually.

Ed. Note: For more detailed description of these works of art, read Earth Science articles: "Man-of-War," Sept., 1955; "Mosaics Fascinate Me," March, 1956; and "Celtic Cross Made of Mother of Pearl," March, 1957.

GLACIERS: The Rockhound's Benefactors

By EMERSON PUGH



Artist's conception, painted in vertical exaggeration, of how the frontal lobe of a pre-historic glacier forced the Mississippi out of its course and made it take a detour course.

WHEN you were struggling with a fresh layer of snow almost every day for a rather extended period last winter, did you begin to wonder if there was a new ice age looming up for the near future? If so, you had learned company, for the question of ice ages, past and future, has been the subject of much study by geologists. Recently there has been a theory developed by Dr. W. M. Ewing and Dr. W. L. Donn of Columbia University which answers these questions, and which has much observational data to support it.

These two geologists reason that the Pleistocene ice ages were started by the migration of the North and South poles into the Arctic and Antarctic oceans. The earth, which had been spinning about an axis which came to the surface in the East Indies, now shifted its axis to the points we now call the North and South poles. This shift may have occurred suddenly or over a period of centuries, and may have occurred in several steps. Magnetic studies of rock formations over widely separated areas of the earth's surface show magnetic patterns which indicate that at some time in the earth's history the North magnetic pole has been located at points ranging from the center of the United States southward and westward through Hawaii and into the area near the Philippine Islands.

The cause of the shifting, while it cannot be proved positively, was probably due to changes in the center of gravity of the earth, caused by deformation resulting from rotational stresses or from volcanic action. This deviation from a true spherical shape exists at present, as shown by measurements taken during the International Geophysical Year. It is thought that the earth shifted its axis of rotation to reduce the stresses which the irregular contour would produce, just as large commercial centrifugal dryers correct for uneven loading by springing their supporting shaft to bring the center of rotation through the center of gravity of the load.

At the time of the shift, the Arctic and Antarctic oceans were ice free; in fact, they were located in a temperate or subtropical area, as shown by the large coal deposits found in Alaska and northern Norway. The vegetation which produced these coal beds could have existed only in temperate or warm climates. With the shift in rotation, two changes occurred. The amount of radiant heat from the sun per unit of area was greatly reduced in the Arctic and Antarctic, and the clouds formed from moisture picked up by the air from the open oceans tended to reflect back an appreciable part of the heat which was directed toward that part of the earth's surface. This caused a drop in the amount of heat reaching the polar areas which has been estimated at about 7% of the total heat reaching the entire earth. Such a decrease was sufficient to lower the temperature in the polar areas enough to produce heavy snowfalls over the entire region.

With the lower temperatures, the snow accumulations over the land areas gradually built up, compacting the lower layers into solid ice. Through the centuries this layer of ice built up until it is estimated that it was from 8,000 to 10,000 feet thick. This is shown by glacial scorings on rock formations which lie at elevations as much as two miles above the level of the valley floors. The pressure on the ice bed due to the tremendous weight of the overlying layers of ice caused the whole bed to flow in the direction of the slope of the earth's surface, just as present day glaciers in the mountains flow down the valleys like enormous streams of congealed molasses or asphalt. In time the icy layer had travelled until it covered the area now known as the Middle West.

This tremendous accumulation of ice affected the polar climate in two ways. The ice itself tended to prevent the normal rise in temperature during the summer seasons, and it also lowered the level of the Arctic ocean, because of the large amount of water which had been removed and was now converted to the glacial ice. The lowering of the ocean level reduced the circulation of warmer water from the temperate regions, since the straits between Greenland and the two continents and through Bering Strait are relatively shallow. With the slowing up of the flow from the warmer oceans and the lowering of the polar temperature, the Arctic ocean finally froze over, cutting off the supply of moisture which had been the source of the heavy snows.

The reduction in the cloud formations in turn permitted more sunlight to reach the surface of the earth, and the ice layers then began to slowly melt along the southern edges. The weight of the layers of ice in the northern regions still caused a glacial flow, bringing countless millions of tons of glacial debris with it, and filling old valleys with the mixture of rock, gravel and soil. The water from the melting glaciers also began to cut new channels, so that the drainage pattern of the entire area underwent considerable modification.

This first glacial epoch is known as the Nebraskan ice age, from the fact that the boundaries of the glaciated area extended as far south as the southern edge of Nebraska, and from the Rocky Mountains to the mid-Atlantic states. Its exact boundaries are not too well established as it was overridden in many areas by the later glaciers which piled huge deposits of glacial debris over the Nebraskan debris. This ice age began about 1,000,000 years ago and lasted approximately 50,000 years.

In the course of many thousands of years the glacial mass melted back enough to raise the level of the oceans to near their former height. The raising of the polar temperature through the increase in the absorption of the solar radiation caused the pack ice on the ocean surface to break up, so that the water was again exposed and moisture pickup increased. This brought the climatic cycle back to the conditions which marked the start of the first ice age, and a second glacial accumulation was started. This second ice age was supposed to have

followed the pattern of the first ice age, and is known as the Kansan ice age. It began about 750,000 years ago and lasted for almost 100,000 years. The glaciated area extended from Kansas City and St. Louis eastward, although it is thought that the chief area from which the ice flows started was located west of Hudson Bay. This change in the source of the glaciers is best explained by a shift in the center of the open seas and a consequent change in the areas subject to the heaviest snowfall. The Kansan ice age was followed by an interglacial period, during which the glaciers melted, depositing fresh layers of drift and through the heavy flows of water produced by the melting ice, again eroding the surface of the land and creating new valleys and drainage patterns.

The Kansan ice age was followed by two other glacial periods known as the Illinoisan and the Wisconsin ice ages. These started about 350,000 and 125,000 years ago, respectively, and each lasted for approximately 100,000 years with a similar interglacial period following each period of glaciation.

The evidence supporting this general theory is varied. For example, Greenland, which lies in the same latitude as the general sources of the glacial flow over North America, is covered by an ice layer at present which is about the same thickness as that which is supposed to have covered Canada and the northern part of the United States. Since Greenland is surrounded by open ocean, the snow deposit has been fairly regular and much heavier than presently exists in northern Canada. The glacial flow from the interior to the shore line, where the glaciers break off to form icebergs, has kept the ice accumulation at a fairly constant level. The same condition holds for the Antarctic continent, where a layer of ice several thousand feet thick covers the land area, and where heavy snowfall is experienced.

The levels of the oceans have changed in a marked manner. Soundings off New York harbor have shown a submerged valley for the Hudson river which extends many miles out. This could have been formed only when the ocean level was low enough to allow the river to continue as a stream many miles to the then existing shore line. Computations have been made which show the glacial formations formerly existing would have lowered the ocean level about 250 feet. This confirms the evidence of the submerged river valleys.

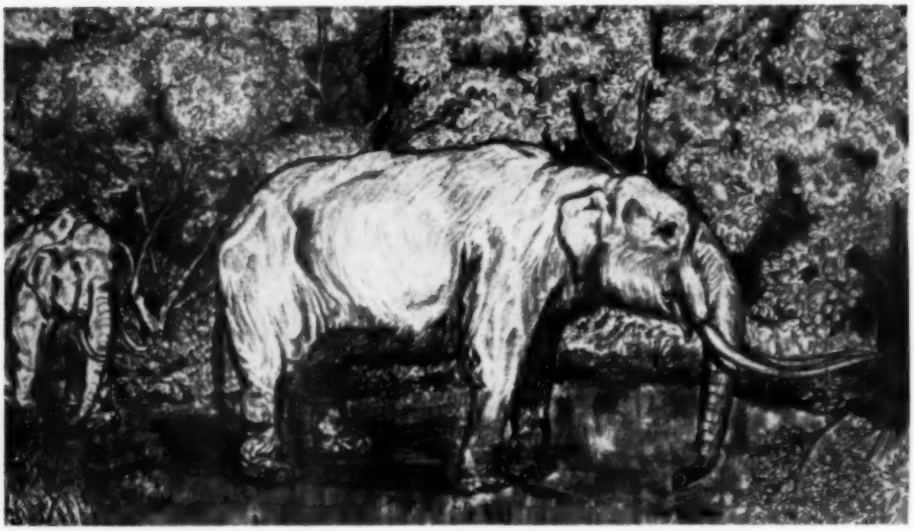
The migration of the poles mentioned previously is substantiated by

(*Continued on Page* 188)

Map showing three detour courses of the Mississippi during the ice age.

Uncover Bones of Mastodon

IMPORTANT NEW FINDS IN INDIANA



Mastodon americanus. Very common in the Southeast during the Pleistocene.

THE bones of a prehistoric elephant known as a mastodon, which roamed the earth many thousands of years ago, have recently been uncovered on a farm in Pulaski county, Indiana some 65 miles southeast of Gary.

The find is regarded as important by geologists and paleontologists because of the nearly perfect condition of the bones. The animal when alive weighed about 10 tons, and measured some 30 feet in length.

Vearn Coates, Shelby, Indiana excavation contractor, was digging a lake on the farm of Carl Huppert, three miles south of Medaryville when the find was made. Virgil Hughags, operator of the power shovel, first uncovered the skull in a peat bog. He at once stopped the shovel and Coates immediately notified the Indiana conservation department.

James Cope, director of the museum of Earlham College, Richmond, Indiana, an anthropologist of note, supervised the excavation and identified the bones as those of a mastodon. He said that all but a few of the bones had been uncovered. The skull is in a perfect state of preservation, and the teeth even are shiny, although they are turning black because of oxidation. He is now also excavating a similar, but less perfect skeleton near Rochester, Indiana.

"VERY GOOD FIND"

"It will be a very good find because of the fine state of preservation of the bones," Cope said, and reported that previously only one other mastodon had been discovered in Indiana and its bones are now in the National Museum in Washington, D.C. The newly discovered

Location of Medaryville where Mastodon bones were found.

skeleton is in such good state of preservation, it seems, because it had been buried under the frost line, the skull being at least six feet deep.

The Chicago Natural History Museum has been given the bones, where eventually, no doubt, they will be placed on public exhibition. It is hoped that future research and investigation may shed some light on the reason why the teeth have remained so well preserved down through all this long period of time. This might prove to be important.

The mastodon was a fur bearing elephant, quite different from the mammoth, which roamed the American continent in abundance during the Pleistocene geological age which came to a close some 8,000 to 10,000 years ago. Mounted skeletons of mastodons are found today in many museums.

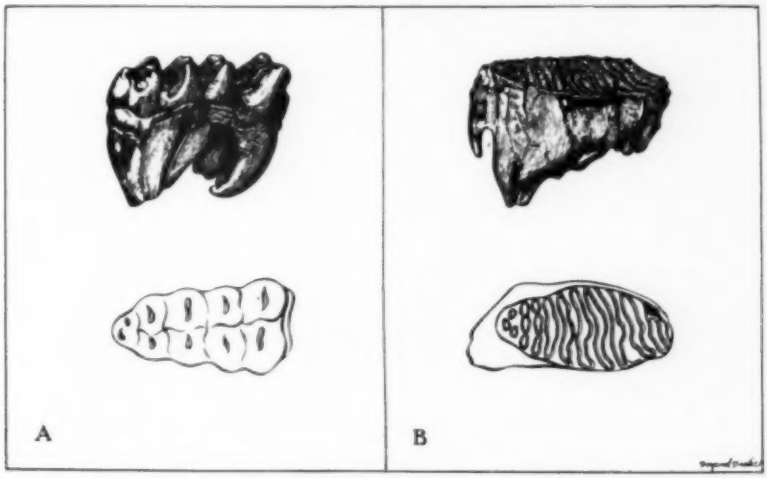
FINDS NOT UNCOMMON

While mastodons are now an extinct species of mammals, they were once common in many regions of the world, including the higher latitudes of North America. In the barren ice fields of Siberia, it is said that their frozen carcasses have been found almost intact, being sufficiently well preserved that edible flesh was yet present on their bones.

Czechoslovak geologists have uncovered mass graves of these primeval mammals evidently killed by gaseous poisoning, during a volcanic eruption, some millions of years ago. These giant like elephants were near the site of a former lake near Filakov, Slovakia, and more than 20 cases of bones, including molars larger than bricks and tusks more than 12 feet long were collected.

Ed. Note: See article "Man and Mastodon in Missouri," Earth Science, May-June, 1956.

Picture. Courtesy of "Georgia Mineral News-Letter."



A—Mastodon's molar. B—True elephant's molar. Side views (top) after Lucas, 1922, p. 160; crown views (bottom) after Colbert, 1955, p. 412.

STATE PARK ATTENDANCE SETS RECORD

ATTENDANCE at State parks and related recreation areas in 1959 was the heaviest on record, with visits totaling 255.3 million, an increase of 17.9 million over 1958 and more than double the total of a decade ago, the Department of the Interior has recently reported. Use of cabins, lodges, and hotels increased 11 percent, tent and trailer camping five percent, and organized camping one percent.

Travel and other data for the Nation's 2,433 State parks and related recreation areas are in *State Park Statistics—1959*, a 36-page booklet compiled by the National Park Service. Basic data for *State Park Statistics* were obtained in a questionnaire survey made by the Service at the request of the National Conference on State Parks. Ninety-two State agencies in 50 States participated in the survey.

Mysterious Chatoyancy

by DR. FRANK L. FLEENER

THE color exhibited by minerals is one of the mineralogical "headaches"—very largely because many minerals refuse to "play the game" according to the rules. This results in much confusion of the entire topic. However, after disregarding these non-conformists we still have a goodly group to which certain rules apply and to which certain mineral species adhere. Minerals may be considered as having personalities built up on characters, habits, and reputations the same as members of the human family—and upon these criteria they can be differentiated and classified. Thus it comes about that we find that there are minerals with very stable characters which can be depended upon at all times, whose colors are innate qualities that never change, one essential constituent of the mineral being the pigmenting agent. For instance, the minerals that contain copper as an important ingredient belong to this group. Greens from malachite, blues from azurite. This group is known as the idiochromatic minerals.

By and large the most prolific groups of colored minerals are known as allochromatic. They are the trouble makers, since they are inveterate borrowers of their decorative finery from other minerals. In their own rights, allochromatic minerals are colorless or white when pure, but due to their propensity for pigments they take on a variety of colors. For example, the minerals of the quartz family. The originals being predominantly clear as glass appear as a group in far gaudier colors then graced Joseph's famous coat. Also, to complicate matters, these pigments may appear in all stages, from faint tinges, to color so dense as to fairly obscure the host mineral. Our last group of colored minerals is one that takes its attractive colors not from pigments or inclusions but from light effects, and it is in this group that we find some mysteries that have baffled even the wise men from the east with all their expensive gadgets. For instance, opals, which present to our entranced sight an awe inspiring array of colors and shades of colors that fairly numb our imaginations. We are simply lost in wonder and the strangest wonder of it all is the fact that the opal has no color of its own! All this breathtaking display is nothing but light which has been broken up within the stone and returned to our feasting eyes in all the tantalizing colors of the solar spectrum. The cause of this unique phenomenon constitutes one of the mineralogical mysteries concerning which no ultimate solution is apparent. However, since occluded water is always present in a live opal and the stone refuses to show opalescence when it is removed we must conclude that water is one of the controlling factors.

But at this point we are confronted by the fact that a good portion of the known mineral species contains water and yet neither wet nor dry do they show any signs of opalization. This quandary has been obviated by conceding that the structure of the material must be made up of very thin plates of silicia with the water very evenly distributed thru out the stone and which when cut across the edges of the plates would produce nature's diffraction grating. This with the aid of the water would produce the desired opalescent effect.

Opalescence according to the accepted definitions consists of a series of milky or pearly reflections from the interior of a stone and is a member of a group known as "play of colors." Many opals exhibit a great variety of internal color which as the stone is turned forms a brilliant patchwork of color or when the stone is observed from different angles turns and follows the incidence of light. This amazing color effect is best observed when the stone is cut with a curving surface.

Chatoyancy is another notable member of the "play of color" group. For an example we select the mineral crocidolite, a well known variety of asbestos, which in certain instances becomes metamorphasized by the oxidation of the iron of its content and by the infiltration of silica into and around the fibers into a variety known as tiger eye which when cut cabochon or with a curved surface exhibits a remarkable chatoyancy, a changeable undulating play of color in the form of a band that plays across the face of the stone. Chatoyancy is a picture word invented by an old French mineralogist who conceived it to resemble the shimmering streak of light reflected from the contracted pupil of a cat's eye when viewed in the dark. As a rule the shimmering wavy line on a tiger eye stone is to be noted, concentrated on the top of the stone, and extending in a direction across that in which the fibers of the stone run. The chatoyancy appears to be an internal reflection caused by the refraction from the parallel fibers combined and given back to the observer in a single plane. Be it known that tiger eye has no monopoly on this striking phenomenon; examples of it occur about us in everyday life. Sun or moonlight falling upon slightly disturbed water appear as elliptical spots of unusual brilliance that move about with the observer always pointing toward the horizon. These are the "Moonpaths" or "Fairways" of childhood tales. Moreover in our category of mineral specimens there are about a dozen minerals that are listed as chatoyant. I believe it is safe to affirm that any translucent mineral that is composed of or includes parallel fibers, tubes, or strings of particles will when properly cut into a cabochon show chatoyancy. These minerals do not have to be hard. Hundreds of pounds of satin spar gypsum are annually turned into chatoyant beads, given a bees wax coating, and sold under fictitious names to the uninitiated at good prices.

(*Continued from Page* 171)

carving "sands" available were a "yellow sand" made of quartz but used only for polishing with a wooden wheel, a "red sand" of garnets used for carving softer stones such as turquoise, a "black sand" made of corundum, and a "Canton sand" of carborundum which is manufactured silicon carbide first produced in 1891. The name "Canton sand" was used since silicon carbide was first imported to China thru this port. "Canton sand" is also a "black sand" and is harder than natural corundum which is crystallized aluminum oxide, but silicon carbide is more friable and loses its cutting power more rapidly than corundum. The final polishing medium was found to be fine silicon carbide mixed with siliceous silt, the main component of the silt being calcite.

The equipment being used was varied. The treadle lathe with assorted shafts for sawing, grinding and polishing was much used. Treadle lathes with iron shafts were sometimes rotated by a flat belt passing over the top of the shaft and down to the two treadles. The drilling of holes was accomplished with a shaft rotated by a bow. The string of the bow being wound around the shaft and pushing the bow back and forth rotated the shaft first in one direction and then reversed the rotation. The shaft was tipped with small diamonds. Hollow shafts are also used with this drill. Besides rotating saws, the wire saw was also much used. A steel wire is strung between the ends of a bow and the bow is pushed back and forth so that the wire acts as a cutting tool. A large bow with a man on each side is used for sawing larger pieces. A single cut often required the labor of three men for a week, the third man being required to feed "sand" into the cut. Smaller wire saws are used to make pierced designs much after the fashion of a jig saw or are also used to enlarge small holes made with a drill.

Of some interest is the technic for hollowing out the inside of bottles, such as snuff bottles. A hollow drill the size of the hole in the neck is first used and the drill is worked down to what will be the bottom of the bottle. The core left by the hollow drill is broken out by one blow if the craftsman is lucky. If not, the core must be laboriously ground and chipped out. Then a tool with wires which spring outwards on the end of it is pushed into the hole. The expanding wires push the "sand" against the side of the hole and the bottle is hollowed out by the rotating action of the tools.

The "sand" is used by mixing with water and applying with the finger, either to the work or the tool. In some cases the tool rotated thru a bowl of wet "sand" to provide a continuous supply. Drilling with diamonds does not require sand, but such drilling was done under water to cool the drill and the work.

All of the power required for the carving was furnished by the arms and legs of the workers. There was considerable specialization among the workers, young boys being used mostly to furnish power. Older workers often specialized in certain operations such as carving chains or loose rings. Some were expert at polishing, others in the making of pierced designs, the division of work into various operations being much after the pattern of specialization in manufacturing in this country.

The origin and age of these modern carving methods are not known, but undoubtedly these technics were used in various forms for many previous years. The quantity and quality of jade carvings made during the Ch'ieu Lung period 1735-1796 would indicate the use of these methods at that time. Perhaps some were used for centuries previous to this time.

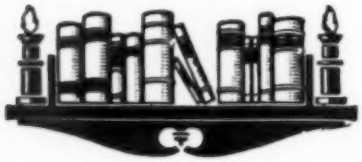
To illustrate the more striking results of carving technics, two pieces have been selected. One is a pierced, fret-saw type of medallion with sculptured front and back. The piece has an extremely high polish and is white jadeite. The Chinese characters included in the design express wishes for ten thousand kinds of happiness

to the wearer. The second piece is a hollowed vase with cover and with a loose ring on each side of the vase. The hollowing is unusual in that it is oval shaped and follows the outside contour very closely. The walls are thin and of uniform thickness. The material is white nephrite with a "wet" polish—very soft and pleasing. The scale of the pieces is small, the vase being five inches tall and the medallion three inches in diameter.

In addition to being examples of carving technic, I feel the two pieces belong together and, in a way, symbolize youth and maturity. The bright, shiny medallion with everything on the surface and its seeking for happiness is like youth. The vase, with its delicate balance on its base, the more varied and richer detail in the loose rings and in the Foo dog finial on the lid is more symbolic of experience, and the finding of a balance among the stresses of life. The careful hollowing seems to indicate all of life does not appear on the surface and that there is an inner life. The two pieces symbolize the different characteristics of youth and maturity.

For me, this symbolism provides an additional value over and above the worth of these two pieces as examples of the jade carving art.

Book Reviews



PENNSYLVANIA PLANT FOSSILS OF ILLINOIS, by Collinson and Startvedt. Educational Series No. 6, Illinois State Geological Survey, Urbana, Illinois.

A Field Book of 36 pages containing highly condensed information on the Carboniferous Flora of Illinois. This pamphlet is exceedingly well illustrated, and gives quite adequate descriptions for the average collector.

It is especially suited for those who visit and collect in the Braidwood-Coal City area of Northern Illinois, and elsewhere where coal measure fossils are to be found.

Since no price is quoted in the booklet, it is assumed that single copies may be had free upon request addressed to the State Geological Survey, Urbana, Illinois.

PHYSICAL GEOGRAPHY. Second Edition. Arthur N. Strahler, Professor of Geomorphology, Columbia University. John Wiley & Sons, Inc. 1960. 534 pp. $7.50.

Professor Strahler defines his subject as the study and unification of a number of earth sciences which give us a general insight into the nature of man's environment. We are daily exposed to the elementary principles of physical geography through such phenomena as climate and the change from daylight to darkness. As an educator, the author claims, with logic, a major place for physical geography in the curricula of liberal arts colleges.

Few of us are so engrossed in everyday living that we do not occasionally pause and wonder why things about us are as they are. Many of the answers are in Professor Strahler's book, i.e., why it is cold in winter and warm in summer, the reason for tides, eight proofs why the earth is round, evolution of the concept of standard time, etc.

In this book there is also meat for those who have long since mastered the minor mysteries listed above and have gone on to the universal polar stereographic grid systems and the Köppen climate system. The two chapters on surface- and ground-water hydrology are new with this edition, also a fascinating chapter "The Earth's Crust." In spite of the legends concerning continents rising from the sea or sinking into it, the author cites evidence to show that our continents and ocean basins have endured throughout all recorded geologic time and have not exchanged places by crustal warping.

For the classroom students and instructors, there are review questions following each chapter, twenty pages of bibliography, and an index. The text is replete with photographs and excellent drawings.

ELEMENTS OF CRYSTALLOGRAPHY AND MINERALOGY. F. Alton Wade and Richard B. Mattox, Professors of Geology, Texas Technological College. Harper & Brothers (Geoscience Series). 1960. 332 pp. $7.50.

In 1912 Friedrich, Knipping, and Laue proved that X-rays are diffracted by crystal gratings. Since that time crystallography (the science of the interatomic arrangement of all solid matter), which had begun as a subdivision of physical mineralogy, is now almost as important in chemistry, biology, and other sciences as it is in mineralogy.

How important crystallography is considered to mineralogy by the present authors is indicated by the fact that they wrote this book as a text for a two-semester course in which crystallography would be studied almost exclusively in the first semester and descriptive mineralogy in the second.

In the section on crystallography, minerals are used when examples are cited, but the fundamental concepts such as symmetry and the constancy of interfacial angles are applicable to all solids. The chapter on classification of crystals into their six different systems is well illustrated with drawings. The principles of crystal chemistry are exemplified by detailed references to the silicate minerals.

The authors proceed to descriptive mineralogy through chapters on physical and chemical properties of minerals, and follow it by a concise summary of economic mineralogy and an interesting chapter on genetic mineralogy and mineral associations.

There is a notable paucity of references. There is a good mineral index besides the general index.

GEOLOGY OF THE INDUSTRIAL ROCKS AND MINERALS. Robert L. Bates, Professor of Geology, Ohio State University. Harper & Brothers (Geoscience Series). 1960. 441 pp. $10.00.

Anyone who has chuckled over the column "Geology in the Public Eye" in GeoTimes knows that its author, Dr. Bates, could not write a dull book. This is confirmed by the appearance of the present volume. It was written to fill the need for a reasonably comprehensive text in teaching the economic geology of the nonmetallics. A familiarity on the reader's part with common geologic terms and concepts is assumed.

Many of the authoritative books on nonmetallics tend to emphasize technology rather than geology. Many are weighted toward a specific subject with which the author is familiar. Dr. Bates, in contrast, has emphasized origin, occurrence, and geologic interrelations of nonmetallics in general. In order to cover this broad field, it was necessary to draw from many sources. He thus serves primarily as a collector, evaluator, and arranger of the work of many others.

The order of treatment is igneous, metamorphic, and sedimentary rocks, and igneous, vein and replacement, metamorphic, and sedimentary minerals. Thirteen rocks and twenty minerals are discussed, most of them from United States deposits.

A LOVELADY REFERENCE CHART OF NATURAL GEMSTONES. Compiled and published by Lee R. Lovelady, Douglas, Arizona. 1960. $1.25.

This chart, 38" x 23", is a handsome and handy source of useful data to hang on a library or workshop wall. No less than 102 natural gemstones are listed vertically, and 20 properties or specific scale values are listed horizontally after each. The gemstones range from the familiar jasper, coral, and agate to rarer forms such as rhodonite and epidote. Besides chemical formulae (an adjacent column "Composition" spells out "Silicon dioxide" in case SiO_2 is not translatable), the chart shows hardness (Mohs'), fracture, optic character, specific gravity, cleavage characteristics, etc.

Mr. Lovelady lists 17 well-known authors, with titles, on whom he has drawn for compilation of his Chart.

ROCK POLISHING FOR EVERYONE. John Willhammer, author and publisher. 32 pp. 1960. $1.00.

Mr. Willhammer began to polish rocks only after he had acquired experience and a perfectionist's skill in machining steel and other metals. His book encourages the beginner by listing and discussing the few really essential tools needed. Although his advice on sawing and grinding is applicable to most rocks, the fascination which Michigan Petoskey stones hold for him shows through early in the book. To overcome the difficulty of polishing these stones, which are relatively soft but contain irregular hardnesses, the author recommends velvet as a polishing material.

INTRODUCTION TO SOLIDS. Leonid V. Azaroff, Associate Professor of Metallurgical Engineering, Illinois Institute of Technology. McGraw-Hill Book Company. 1960. 460 pp. $9.50.

The one thing, says the author, that the majority of solids of practical importance have in common is that they are crystalline. It is logical, therefore, to use crystallinity as a framework within which to discuss the nature and properties of solids. Our knowledge of solids has advanced along many fronts in recent years. As late as 1912 the Braggs in England first determined by means of X-ray diffraction spectra the atomic arrangements in a large number of solids. The two-wave-length microscope has made possible magnifications as high as a hundred million times.

The author begins with an outline of the mathematical rules that govern the formation of crystal structures and the properties of periodicity and symmetry. Data common to all crystals are further presented under headings of Structure (Closest Packings, Voids), Atomic Packings (Pauling's Rules), Mechanical Properties (Plastic and Elastic Deformations), Formation and Transformations in Crystals, and the Bonding of Atoms.

Finally, in these days of increasing specialization we are glad to note that Dr. Azaroff took pains to express himself clearly and to relate his study of crystal patterns to the "simple elegance of the basic patterns" to which nature conforms.

Midwest Club News

Mrs. Bernice Rexin, Club Editor

3934 N. Sherman Blvd.
Milwaukee, Wisconsin

EAST OHIO LAPIDARY CLUB held its annual picnic at the home of Trudy Larson, Burton, Ohio, on July 10. The program for the day included a visit to the American Metals Institute of Newbury, Ohio to view its rock and mineral display in its Mineral Garden. On July 23 the club planned to visit the quarry at Clay Center, Ohio.

CENTRAL IOWA MINERAL SOCIETY planned to visit Keokuk, Iowa on Aug. 6-7. This area is famous for its interesting and plentiful geodes.

WABASH VALLEY GEM & MINERAL SOCIETY recently viewed a short film, "The Earth in Motion," and then heard an interesting talk on "Slab Identification," by Dr. Tranter, who illustrated his talk with examples from his own beautiful collection of slabs.

MICHIGAN GEM & MINERAL SOCIETY, following a visit to the Paul Frank Quarry near North Vernon, Mich., reported that the calcite found in this quarry is absolutely fabulous and few of its members have seen calcite of a comparable quality.

MINNESOTA MINERAL CLUB made a late spring field trip to the Blue Hills of Wisconsin to collect catlinite (pipestone) and quartzite. Catlinite is not suitable for gem material, but it can be carved easily and the prehistoric Indians worked it into artifacts of great beauty. Contrary to popular belief, these artifacts were not pipes.

CHICAGO LAPIDARY SOCIETY'S last meeting before summer recess featured a travel movie, "Cordilleran Horizons," by Helen and Goff Cooke. The club has requested the Cookes to show another of their popular movies in the fall. Recently the club visited the North Shore Baptist Church, 5244 North Lake Wood, Chicago, to attend services and hear a talk on the Jade Window which was presented to this church by the late James L. Kraft.

MEMPHIS ARCHAEOLOGICAL & GEOLOGICAL SOCIETY recently enjoyed a talk on "Indian Pottery," by Mr. J. E. Boone, who also gave a demonstration on the reconstruction of pots from sherds. Junior members of the society have been invited to attend a five-week course on "Rocks and Minerals" at the Memphis Museum. The course will be based on the Golden Nature Guide's book on "Rocks and Minerals."

CHICAGO ROCKS AND MINERAL SOCIETY'S Micro-Hunters Section reminds paleontologists that fossil collections can be greatly augmented by microfossils and urges them to examine every likely-looking specimen in the field with a magnifying glass. This is how one of its members discovered a collection of little "clams" on an otherwise nondescript nodule while collecting in the Mazon Creek fern fossil area.

MIAMI VALLEY MINERAL AND GEM CLUB reports that Indian pits were damaged in the state park at Flint Ridge, Ohio when unknown persons dynamited the ridge for flint. Dynamiting in a state park is a very serious violation of the law, but visitors to state parks are also warned that digging in the parks is also prohibited.

GRAND RAPIDS MINERAL SOCIETY has published for its members a seven-page list of books available from the Grand Rapids Library that are of interest to earth scientists and lapidaries.

KALAMAZOO GEOLOGICAL AND MINERAL SOCIETY'S first rock show was a great success. The local population and visitors from other Michigan clubs kept the show room crowded at all times. An auction held in connection with the show yielded $155.00 for the club's treasury. Thirteen new members signed up during the show.

EARTH SCIENCE CLUB OF NORTHERN ILLINOIS recently enjoyed a program on "Photographing Minerals," by Mr. and Mrs. Loren Root. Photographed mineral specimens were shown on a screen and later the viewers were shown a display of the actual mineral specimens photographed. Considerable fine detail was shown in the slides that was not easily observed in the original.

DES PLAINES VALLEY GEOLOGICAL SOCIETY recently enjoyed a demonstration lecture on making "V-Lock Jewelry," by Doris Kemp. This method of mounting stones uses no solder and has unlimited design possibilities. It is especially good for making gemstone mobiles.

MICHIGAN LAPIDARY SOCIETY, undaunted by distance, recently made a week end trip to the Crater of Diamonds near Hot Springs, Arkansas. Member Sylvia Blair found a very pretty .34 carat, canary yellow diamond with sharply defined faces. Seventy persons, including members of several other Michigan clubs, made the trip. The group also collected quartz crystals at Crystal Mountain and novaculite at Magnet Cove.

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magnetic studies of strata of bed rock at various points on the earth's surface. Igneous and metamorphic rock tend to have magnetic components magnetized in the direction of the earth's field as they cool down below the Curie temperature or point at which they become magnetic. Sedimentary rock has the magnetic components aligned as they are deposited. Thus the direction of magnetization of these layers shows the direction of the earth's magnetic field at the time of their formation, which in turn gives an indication of the path followed and the time of occurrence of the polar shifts.

From this theory we may conclude that in another 15-25,000 years air cooling will be no problem in this area, for at that time the opening of the polar seas will again permit heavy snow deposits over northern Canada. These will consolidate to form glaciers, which will again start flowing along the line of the earth's slope, and ranch houses may be supplanted by igloos.

This rather chilly picture for the future has been relieved during the past year by a second theory for the glacial period, developed by geographers at Clark University, and based upon data collected during the International Geophysical Year.

According to this new theory, there has been but one ice age, and the glaciation had its limits at the southern boundaries of the Nebraskan, Kansan and Illinoisan till sheets. At the time of greatest glacial coverage, the ice accumulation was so great as to depress the crust of the earth, permitting the sea to penetrate from the Gulf area to the edge of the glacial deposit. These seas or bays were kept fresh by the enormous outflow of water from the melting glacier edges. Large quantities of stones and boulders, which had been brought down by the glacier, were carried by the icebergs which broke off from the glacier edges and deposited on the submerged areas of northern Kentucky, southern Missouri and eastern Iowa as the icebergs melted. There were also deposits of gumbo clays and driftwood along the margin of this fresh water sea, making up the strata which have been identified as interglacial deposits.

As the glacier melted back to what is designated as the Wisconsin glacial boundary, the relief from the weight of the ice cap resulted in an upthrust of the earth's crust. This raised the bottom of the fresh water seas sufficiently to drain them and new streams such as the postglacial Ohio, Missouri and Mississippi rivers appeared. These began cutting new valleys. The ice cap now terminated on dry land and the deposits from the streams of ice water now formed outwash plains. The drumlins which began to appear as the glacier receded were the result of land movements beneath the ice cap. The further retreat of the ice cap resulted in additional uplifts of the earth's crust, with resultant changes in stream lines and alluvial deposits.

The significance of this new theory lies in the fact that it does not necessarily imply a recurrence of the glacial periods, as does the previous theory. Much will depend on the character and extent of future land movements which may or may not give rise to large amounts of open water in the polar areas, from which moisture can be picked up to be deposited later as snow in the Arctic and subArctic areas of Canada, northern Europe and Asia.

Monocrystalline Speleothems

By JAMES F. QUINLAN, JR.

Speleothems are secondary mineral deposits that are formed in caves. The terms internally and externally monocrystalline are introduced to describe those dripstone speleothems—stalactites, helictites, stalagmites and columns—which fracture along a cleavage plane rather than irregularly. A monocrystalline speleothem consists of an aggregate of small crystals, all or most of which have a similar optical orientation. Those monocrystalline speleothems that have a polygonal cross-section are classed as externally monocrystalline. The following observations have been made: 1) Monocrystalline speleothems consist of calcite. Some contain minor amounts of aragonite and silica. 2) All the cleavage planes of a monocrystalline speleothem are those of a typical calcite rhomb whose optical c-axis coincides with the long axis (axis of growth) of the speleothem. 3) The tip of most monocrystalline speleothems is triangular. 4) Externally monocrystalline speleothems may have 3, 4, 5, 6, 8, 10, or 12 sides, not all of which are necessarily equally developed. 5) Growth striations are often present. They are parallel to the cleavage plane(s). 6) Some monocrystalline speleothems consist of a monocrystalline core that is covered by a sheath of either radially deposited calcite, clay, or perhaps aragonite. In some specimens the monocrystalline core is due to precipitation within the central tube. In a few other specimens it appears that there never was a central tube as such. 7) The central tube of some externally monocrystalline stalactites has a rhombic cross-section rather than the typical round cross-section. 8) Transitions exist between monocrystalline and "typical" dripstone speleothems. A section through a stalactite, for example, may show a monocrystalline cleavage while another section an inch away may exhibit an irregular fracture and a radial structure. 9) Some stalactites have been found to consist of twinned calcite crystals. One of these specimens possesses a second central tube which is sealed at one end. The twinning could have been brought about by either the bifurcation of the primary central tube, or by the union of two adjacent monocrystalline stalactites. 10) Some apparently monocrystalline stalagmites exhibit a radially mosaic texture in thin section. This texture is expressed by the saddle-shaped rhombic cleavages of these stalagmites. These stalagmites are roughly triangular in cross-section. 11) Some monocrystalline stalactites cleave in a plane which has six small saddles that occur at the periphery of the stalactite and give it a stellate appearance. In thin section these saddle-shaped areas are characterized by off-center optic axis figures.

The conditions that determine the occurrence of monocrystalline speleothems instead of the development of the more typical forms are not known. Probably the development of monocrystalline speleothems is directly influenced by: 1) Presence or lack of chemical impurities, 2) Lack of contaminating clay, 3) Drip rate of calcium bicarbonate solution, 4) Rate of precipitation, and 5) Temperature.

(This paper was presented at the annual meeting of the Virginia Academy of Sciences in Charlottesville, Va., on May 8, 1959)

HAVE YOU HEARD OF LEAVEITITE?

A NEW name for what perhaps is not a new mineral has recently been coined, and may now be found in the vocabulary of many Rockhounds. They call it 'leaveitite' and no doubt the name will eventually receive wide acceptance. It really is no good, so 'leave it' lay on the ground right where you found it.

RECOMMENDED READINGS

"Rockhound Stamps," by Marguerite Utz. Summer issue of *The Gravelog*. Describes many stamps of interest to the rock and mineral hobbyist. Even if you do not collect stamps, you will find this article interesting.

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FIRELANDS GEOLOGICAL CLUB opened its summer field trip schedule with a trip to Athens, Ohio under the guidance of Dr. Blickle, Professor of Botany and Paleontology at Ohio University. Members of the club collected many excellent plant fossils from a layer of clay located just above a layer of coal in the banks along Brush creek. Dr. Blickle then took the group to see a fossil bed in the making. This is a fan shaped delta, which Dr. Blickle has been studying for years, which has been formed by drainage from a coal mine on the hill above it. He picked up leaves from the surface of this highly acid (sulfuric), swamp-like area and showed how they were covered with limonitic travertine and explained that if the leaves are left there, they will in time become leaf fossils.

ST. LOUIS GEM & MINERAL SOCIETY is planning a combined show and auction in the fall. Prizes will be awarded for the best exhibits.

ELKHART MINERAL SOCIETY at its June meeting viewed "As Old as the Hills," a new film just released by the Norton Company in celebration of its 75th Anniversary. The film opens with scenes of roaring mountain streams, eroded hills and angry seas, showing the action of nature's own abrasive forces. It demonstrates how early man shaped his first crude tools with sand as an abrasive and how abrasives are used today in our modern civilization.

MID-IOWA ROCK CLUB and the SAC & FOX LAPIDARY CLUB held a Rock-Swap session and co-operative dinner for all rock societies in Iowa on July 31 in Edmundson Park in Oskaloosa, Iowa. The result was a brisk and friendly exchange of ideas and rocks and many new friendships.

EVANSVILLE LAPIDARY SOCIETY recently made a field trip to Harrison County, Indiana to collect flint at the site where Indians collected it before the white men came to Indiana. The remains of old Indian pits can still be seen in this area.

TRI-STATE GEM & MINERAL SOCIETY OF DUBUQUE recently visited Schoor Quarry near Maquoketa, Iowa. The fossils found in this quarry are from the middle Silurian period, between 360 and 320 million years ago, and include fair-sized cephalapods, crinoid stems and brachiopods, especially the pentamerus. Vugs in the quarry often yield pinkish calcite crystals which make nice calcite specimens.

MICHIGAN MINERALOGICAL SOCIETY recently enjoyed a combined picnic and auction. A caterer was hired for the outing so that no member would be cut off from the fun by cooking and serving duties.

NEBRASKA MINERAL AND GEM CLUB recently made a field trip to the Buildex quarry near Ottawa, Kans. to collect fern fossils, fossilized reptile tracks and rain prints. Afterwards the club visited Dr. Carpenter's Museum in Ottawa.

DES MOINES LAPIDARY SOCIETY'S last program before the summer vacation period featured "Locations of Rocks and Minerals," by Ray Ruehl. Mr. Ruehl described many choice collecting areas in the United States and made available, to the society, information about many other localities. He keeps an index card file on such localities.

INDIANA GEOLOGY AND GEM SOCIETY made a field trip recently to Weisburg, Indiana to collect fossils from cuts along the railroad. R. H. Shaver, author of "Adventures with Fossils," reports that when these cuts were new 50 years ago, an Indiana University professor and his students spent two summers taking a ton of beautiful Ordovician fossils from along a nine-mile stretch of the track. "Pickers" have been working here ever since then and it is still the best place in Indiana for trilobites.

Other Societies

SNAKE RIVER GEM AND MINERAL CLUB has arranged a permanent display of rocks and minerals in the lobby of the Hotel Washington in Weiser, Idaho. The hotel also furnishes visitors with directions to the home of John Class where a 237-pound agate, thought to be the world's largest, is on display.

MINERALOGICAL SOCIETY OF PENNSYLVANIA recently heard James Beerbower, professor of geology at LaFayette College and author of "Search for the Past," speak on "The Work of the Paleontologist." To illustrate his points, Professor Beerbower used a fossil he found of a little-known amphibian, called diplocerospis, which lived 250,000,000 years ago.

OREGON AGATE AND MINERAL SOCIETY reports that six clubs in Montana recently formed the Montana Council of Rock and Mineral Clubs for the purpose of exchanging ideas, programs and speakers. It plans to hold a state show in Bozeman, Montana in 1961.

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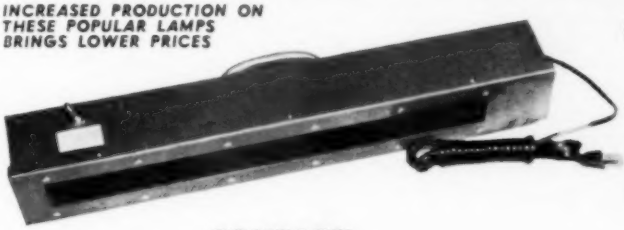

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For further details, contact Richard N. Lake, P.O. Box 361, Chisholm, Minnesota.

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